Before the

Federal Communications Commission

Washington, D.C. 20554

In the Matter of	)	
	)	
Review of Part 15 and other Parts of the	)	ET Docket No. 01-278
Commissions Rules.	)	RM-9375
	)	RM-10051
	)	

To: The Commission

Comments of Spacenet Inc and StarBand Communications, Inc.

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February 12, 2002

SUMMARY

Spacenet Inc. and StarBand Communications, Inc. welcome this opportunity to submit comments that focus on elimination of existing and potential harmful interference to licensed VSAT operations caused by unlicensed Part 15 devices operating in the Ku and Ka bands. More specifically, we request that the Commission immediately refer this clear violation of the Commission's Rules to its Enforcement Bureau for expedited resolution. The FCC Laboratory has unambiguously determined that radar detectors operating in the Ku and Ka bands are causing harmful interference to licensed VSAT operations. That fact is undisputed in the context of this proceeding. The Commission should not tolerate such interference to a licensed service any longer than is necessary to afford violators whatever rights the Act provides unlicensed operations.

To ensure that new sources of interference from unlicensed devices do not arise in the Ku and Ka bands, we further request that the Commission amend Section 15.101(b) of its Rules by extending the equipment authorization requirement to receivers that tune to an upper limit of 38.6 GHz.

Finally, we request that the Commission modify Section 15.209 of the Rules to protect downlink operations of Fixed Satellite Service (FSS) licensees in the Ku and Ka bands by adopting radiated emission limits for unlicensed receivers that are tailored.

Through the combination of enforcement action directed at known sources of harmful interference and rulemaking to prospectively minimize the potential for harmful interference, the Commission will effectively resolve this continuing threat to the reliable operations of licensees that form a central element of the national information/ communications infrastructure.

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Spacenet Inc. ("Spacenet") and StarBand Communications Inc. ("StarBand") (collectively "Spacenet/StarBand"), pursuant to Section 1.415 of the Commission's Rules, hereby submit comments in response to the Federal Communications Commission's (the "Commission" or "FCC") Notice of Proposed Rulemaking to review and update certain rule provisions that relate to authorization and use of unlicensed devices.[1] Our comments focus on the issue of primary concern to Spacenet/StarBand: the elimination of existing and potential harmful interference to licensed VSAT operations caused by unlicensed Part 15 devices operating in the Ku and Ka bands. The FCC Laboratory has unambiguously found[2] that radar detectors operating in the Ku and Ka

[1] *In the Matter of Review of Part 15 and Other Parts of the Commission's Rules,* Notice of Proposed Rule Making and Order, ET Docket 01-278 (rel. Oct. 15, 2001) (*"NPRM").*

[2] Data generated by the FCC Laboratory testing of emissions generated by a variety of radar detectors typical of those marketed, distributed and used in interstate commerce are provided in Attachment 1. The Office of Engineering and Technology staff shared the contents of Attachment 1, which we understand is a redacted version of the Laboratory testing results prepared by FCC staff, with both Spacenet and

Footnote continued on next page

bands are causing harmful interference to licensed VSAT operations. In light of that finding, Spacenet/StarBand request that the Commission immediately refer this clear violation of the Commission's Rules to its Enforcement Bureau for expedited resolution. Spacenet/StarBand further request that the Commission amend Section 15.101(b) of its Rules by extending the equipment authorization requirement to receivers that tune to an upper limit of 38.6 GHz, in order to ensure that new sources of interference from unlicensed devices do not arise in the Ku and Ka bands.[3] Finally, Spacenet/StarBand request that the Commission modify Section 15.209 of the Rules through adoption of radiated emission limits for unlicensed receivers that are tailored to protect sensitive downlink operations of Fixed Satellite Service (FSS) licensees in the Ku and Ka bands. Through the combination of enforcement action directed at known sources of harmful interference and rulemaking to prospectively minimize the potential for harmful interference, the Commission will effectively resolve this continuing threat to the reliable operations of licensees that form a central element of the national information/communications infrastructure.

I. INTRODUCTION

Spacenet, a wholly owned subsidiary of Gilat Satellite Networks, provides a national satellite technology platform through its licensed VSAT network. Satellite service is the only broadband technology universally available throughout the United States. For customers

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manufacturers of radar detectors several months ago. As discussed in greater detail herein, the FCC Laboratory test results independently corroborate the results of technical studies generated by Spacenet and other authorized VSAT providers.

[3] Spacenet/StarBand take no position on the merits of the NPRM's proposed changes to emission limits in the frequency range above 38.6 GHz.

with requirements for wide-area broadband networking capabilities, VSAT services, such as Spacenet's, provide a uniquely cost-effective, flexible and highly reliable means of supporting a wide range of devices and applications. The Spacenet technology offers two-way communications with channel speeds and throughput of up to 40 Mbps outbound to remote locations and 153.6 kbps inbound on the return path. In addition, Spacenet's technology platform provides a uniquely convenient environment for accommodating network and bandwidth expansion, as well as migration to new applications and interface requirements. As a result of these attributes, Spacenet provides broadband networking to manage key operations of the oil and gas production and distribution; transportation; emergency government services; and information and communications sectors of our nation's critical infrastructure.[4]

StarBand, a strategic alliance of Gilat Satellite Networks, Microsoft Corporation and Echostar Communications, is America's first consumer two-way, always-on, high-speed satellite Internet service provider. With the completion of its first full year of operations, StarBand provides broadband service to nearly 40,000 paying subscribers in all fifty states.

[4] The Federal government's Critical Infrastructure Assurance Office adheres to the widely accepted practice of identifying six of our nation's infrastructures as "critical" because their incapacity or destruction could have a debilitating regional or national impact. These critical infrastructure sectors are: a) Information and communications; b) electric power generation, transmission and distribution; c) oil and gas production and distribution; d) banking and finance; transportation; e) water supply and f) emergency government services. The "emergency government services" sector includes such elements as public health, emergency response, law enforcement and hazardous material control. Critical infrastructure assurance seeks to achieve readiness, reliability and continuity of infrastructure services so that they are less vulnerable to disruptions, so that any impairment is of short duration and limited in scale, and so that services are readily restored when disruptions occur. *Statement of John S. Tritak, Director, Critical Infrastructure Assurance Office,* "Critical Infrastructure Protection: Who's in Charge?" Senate Committee on Governmental Affairs, Thursday, October 4, 2001. Spacenet is capable of providing broadband service to all critical infrastructure sectors, and has provided regional electric utilities with the capability to remotely monitor and poll power generation and distribution. In addition, Spacenet has provided banking and financial institution with data management capabilities, including electronic funds transfers and operation of automatic teller machines. Owing to the dynamics of Spacenet's subscriber base, it is likely that Spacenet will resume serving other participants in these two critical infrastructure sectors.

StarBand subscribers range from consumers living in major urban/suburban population centers, to a Navajo Nation tribe located on the floor of the Grand Canyon, or an Alaskan college community center located above the Arctic Circle. For households without access to high-speed cable modems or Digital Subscriber Line (DSL) technology, StarBand brings customers Internet service that achieves speeds up to ten times that of dial-up service.[5] In recognition of its unique achievements, in September 2001, StarBand received the "Most Innovative Internet Service Provider" award, sponsored by *Interactive Week* and *The Net Economy*. In January of 2002, StarBand was also awarded one of twenty-one "finOvation Awards" for product excellence by readers and editors of Farm Industry News.

In December 2000, Spacenet shared technical data with the Enforcement Bureau, the Office of Engineering and Technology and the International Bureau concerning the interference caused by automobile radar detectors. The technical data demonstrated that radar detectors were the likely source of harmful interference to licensed VSAT operations in the Ku and Ka bands.[6] At the request of the Enforcement Bureau and the Office of Engineering Technology, the FCC's Laboratory conducted independent testing of various

[5] StarBand's download speeds are up to 500 kbps (targeted minimum speeds in excess of 150 kbps). In more tangible terms, a file that would take 5 minutes to download via dial-up Internet service would download via StarBand in as little as 30 seconds.

[6] Identification of the interference source was difficult due to the potentially transient nature of the interference, the technical difficulty of remotely troubleshooting terrestrial interference and the sophisticated test equipment and technical personnel required on-site to identify the interference source. Spacenet therefore retained a consultant to monitor and measure the downlink spectrum of a VSAT believed to be experiencing frequent chronic service interruptions. The consultant confirmed that radar detectors were the source of the VSAT interference service interruption. Further, it is now evident that the unintentional emissions from many current radar detectors are incompatible with licensed VSAT operations. Spacenet's consultant also spent several months examining whether shielding of the VSAT terminal might provide an immediate and practical defense against the radar detector emissions. As a general matter, Spacenet's consultant determined that it was infeasible to construct shielding that could reliably protect licensed VSAT operations from the harmful interference caused by radar detectors. Even if it were possible to develop this type of shielding solution, installation at each of the several thousand licensed VSAT terminal sites would be prohibitively expensive, would impair terminal operation and would increase the dish size substantially, raising zoning concerns throughout the country.

radar detector models. The FCC Laboratory's test results demonstrated that the radar detectors generate extremely high levels of unintentional emissions, with field strengths exceeding the current Part 15 emission limits by 36 to 56 dB.[7] These field strength measurements of emission levels were found to be more than sufficient to cause interference to any of the hundreds of thousands of installed and licensed Fixed Satellite Service (FSS) Ku-Band VSAT terminals operating throughout the United States[8]. The Laboratory further concluded that the level of emissions reflected in its test results is sufficiently high to call into question whether the radar detectors were designed in accordance with sound engineering practices.[9] Spacenet formally brought this matter to the attention of the relevant FCC Bureaus and Offices in a letter dated June 15, 2001.[10]

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[7] Spacenet understands that the FCC Laboratory tested the various radar detector models by applying the frequency measurements for unintentional radiators specified in Section 15.33(b) of the Commission's Rules. The Office of Engineering Technology, together with the International Bureau, also placed some random telephone calls to various licensed VSAT operators to determine whether they have experienced harmful interference from unlicensed devices. This exercise produced two technical studies, one prepared by Telesat Canada, entitled "Radio Frequency Interference from Police Speed Radar Detectors," and a second prepared by Bell Laboratories, entitled "Radar Detector Interference-Characteristics and Recommendations."

[8] As noted in the NPRM, it is established that satellite downlinks are very sensitive to radiated emission levels because downlinks use very low receive levels. *NPRM* , ¶ 8. *See also* 47 C.F.R. § 15.15(c) ("Since the operators of Part 15 devices are required to cease operation should harmful interference occur to authorized users of the radio frequency spectrum, the parties responsible for equipment compliance are encouraged to employ the minimum field strength necessary for communications, to provide greater attenuation of unwanted emissions than required by these regulations, and to advise the user as to how to resolve harmful interference problems.")

[9] *See* 47 C.F.R. § 15.15 (a) ("An intentional or unintentional radiator shall be constructed in accordance with good engineering design and manufacturing practice.")

[10] *June 15, 2001 Letter to Donald Abelson, Chief, International Bureau; David Solomon, Chief, Enforcement Bureau; and Bruce Franca, Acting Chief, Office of Engineering and Technology, Re: Harmful Interference to Licensed VSAT Operations.*

II. THE UNDISPUTED HARM CAUSED BY RADAR DETECTORS TO LICENSED VSAT OPERATIONS REQUIRES PROMPT ENFORCEMENT BUREAU ACTION.

A. Radar Detectors Violate the Commission's Rules.

As observed in the NPRM, approximately half a dozen businesses manufacture radar detectors. The manufacturers do not dispute that their products produce high levels of emissions. Instead, the manufacturers explain that the detectors "use a simple design that allows the internally generated tuning signals to radiate directly out the receiving antenna, which has a high gain and concentrates the energy in certain directions."[11] Current provisions of Part 15 do not require the manufacturers of these radar detectors to comply with specific emission levels, or to obtain prior authorization before making their equipment available for sale in interstate commerce. Nonetheless, as discussed fully below, manufacturers are responsible, under the Act and the Commission's Rules, for minimizing the interference potential of unintentional emitters in order to avoid harmful interference to primary licensed users. It is clear from the FCC Laboratory tests that avoidance of harmful interference was not a significant consideration for radar detector manufacturers. Indeed, the manufacturers have advised the Commission that compliance with Part 15 receiver emission limits could only be achieved through redesign of the detectors.[12]

Any Part 15 device is required to cease operations if it causes interference to a licensed radio service, even if the device at issue is not subject to emission limits.[13] Where an unlicensed device is likely to cause widespread harmful interference, the FCC has

[11] NRPM, ¶ 13.

[12] *Id.*

authority, pursuant to 47 U.S.C. §§ 151, 154(□), 301, 302, 333 and 510, to proceed in the public interest against the manufacturer to protect the integrity of licensed users.[14] It is beyond doubt that the radar detectors are causing harmful interference to licensed VSAT terminals throughout the country. As a result, the infrastructure sectors reliant upon VSAT service to ensure their efficient and effective functioning are subject to ongoing and random disruptions, which in many cases result in a total loss of service for a significant period of time [15]

The Commission has examined the issue of accommodating *licensed* terrestrial and satellite operations in the same spectrum band.[16] In such instances, the Commission made the threshold determination to consider the feasibility of such operations only because the terrestrial licensees offered fixed service. In contrast to mobile terrestrial services, where numerous transmitters dynamically change locations, transmitters for fixed terrestrial

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[13] 47 C.F.R. §15.5(b). *NPRM,* ¶10.

[14] *See In the Matter of Rocky Mountain Radar, Application for Review,* Memorandum Opinion and Order, 12 FCC Rcd 22,453 (1997).

[15] Harmful interference is defined as any emission, radiation or induction that seriously degrades, obstructs or repeatedly interrupts a radiocommunications service. 47 C.F.R. § 15.3(m). The Commission has treated "harmful," "unacceptable" and "significant" interference as interchangeable concepts. *Compare In the Matter of Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, First Report and Order and Further Notice of Proposed Rule Making, ET Docket 98-206, (Adopted November 29, 2000), ¶10 (proceeding to ensure that NGSO FSS operations do not cause "unacceptable interference" to incumbents), *with* ¶10 (sharing between incumbents and terrestrial "newcomers" would raise "significant interference concerns").

[15] *In the Matter of Amendment of the Commission's Rules to Establish Part 27, the Wireless*

[16] *In the Matter of Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service (WCS),* Memorandum Order and Opinion, GN Docket 96-228*,* (Adopted 3/31/97); *In Re Amendment of the Commission's Rules to Relocate the Digital Electronic Message Service From the 18 GHz Band to the 24 GHz Band and to Allocate the 24 GHz Band For Fixed Service,* Memorandum Opinion and Order, ET Docket No*. 97-99,* (Adopted 2/9/98); and *In the Matter of Procedures to Govern Use of Satellite Earth Stations on Board Vessels in Bands Shared With Terrestrial Fixed Service,* Notice of Inquiry, IB Docket No. 02-10, (Adopted 1/23/02).

services are stationary, thereby enabling the imposition of geographic as well as spatial separation between terrestrial transmitters and licensed satellite terminals.[17] Even under those circumstances, the Commission has generally avoided co-primary licensing of satellite and other services because of the significant possibility that widespread harmful interference would result. Thus, while the Commission made an initial determination to permit a limited form of licensed terrestrial service on a co-primary basis with licensed Ku band satellite operations, the commitment to prevent harmful interference to incumbent licensees was reinforced by imposing power and outage limits in addition to geographic/spatial separation.[18]

Part 15 of the Commission's Rules makes clear that, in contrast to licensed transmissions, unintentional emitters must, in addition to not causing interference to licensed services, must actually accept harmful interference from licensed services and other unlicensed devices.[19] Nonetheless, the FCC Laboratory has found that radar detectors operating in the Ku and Ka bands generate very high levels of emissions. These radar detectors, in fact, generate emissions many times the level of permissible emissions for

[17] In instances where the fixed terrestrial service and the satellite service both contemplate installation of an in-band transmitter for each consumer subscriber, the Commission has found the interference potential too great to authorize band sharing. *See In the Matter of Rulemaking to Amend Parts 1,2,21 and 25 of the Commission's Rules to Redesignate the 27.5 – 29.5 GHz Frequency Band, to Reallocate the 29.5 – 30.0 GHz Frequency Band, to Establish Rules and Policies for the Local Multipoint Distribution Service and For Fixed Satellite Services,* First Report and Order and Fourth Notice of Proposed Rulemaking, CC Docket No. 92-297, (Adopted 7/17/96).

[18] This proceeding also addresses co-existence of other licensed services new to the band with incumbent licensed operations. *In the Matter of Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, First Report and Order and Further Notice of Proposed Rule Making, ET Docket 98-206, (Adopted November 29, 2000).

[19] 47 C.F.R. §15.5 (General Conditions of Operation).

licensed fixed terrestrial services with *co-primary* status to FSS services in the Ku band.[20] Moreover, because radar detectors are used in all types of motor vehicles, the nature of the interference caused to licensed VSAT operations is especially unpredictable and insidious.

It does not appear that the detector manufacturers gave priority to either sound engineering or manufacturing practices, as required by the Commission's Rules, but rather were only concerned with minimizing manufacturing costs in order to maximize their profits. In determining whether their equipment complied with the FCC's rules, the manufacturers gave little, if any, priority to a radar detector design that, in accordance with Commission Rules, employs the minimum field strength necessary to attenuate interference. Indeed, to the contrary, manufacturers have recently started use of swept frequency oscillators at different frequencies to enhance detection of police radar while making it more difficult for police to detect the presence of radar detectors in vehicles.[21] That change in radar detector design has <u>increased</u> interference to licensed VSAT providers.[22]

The facts are beyond dispute, as is the public interest calculus. Spacenet provides broadband services to oil and gas companies that enable highly effective monitoring of pipeline operations through continuous communications and data acquisition cycles. A health information network serving the medical community, as well as a national retail pharmacy, use Spacenet's broadband satellite network services for high-speed search engines; managing data requirements such as insurance information, patient profiles or drug interactions, telemedicine and continuing education. National trucking and freight

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[20] *See* 47 C.F.R. §§25.203, 25.204 and 25.251.

[21] *NPRM,* ¶14. It is established that the primary use of radar detectors is to promote unsafe driving practices.

[22] *Id.*

companies rely upon Spacenet for fleet management and financial applications such as bills of lading and invoicing. Internet service providers rely on Spacenet's ubiquitous, "always on," two-way broadband connection to provide faster access to a broader range of subscribers, including customers living in rural or isolated locations. An increasing number of businesses turn to Spacenet for a cost-effective, highly reliable source of redundant communications and information capabilities. StarBand provides ubiquitous and reliable broadband services to consumers throughout the 50 states, including the most isolated and rural parts of the country, at distance-insensitive prices.

B. Prompt Enforcement Action Is Required

Since radar detectors are causing harmful interference to Spacenet/StarBand's licensed operations, the Commission must, in accordance with its own rules, require that radar detectors cease operation in the Ka and Ku bands now.[23] Expedited resolution of the interference is imperative. The rulemaking process is lengthy and, if it is the sole tool the Commission uses to put an end to the harmful interference, that relief will be postponed for a prolonged period of time, while Spacenet/StarBand and their customers suffer from interference the Act and the Commission's rules were intended to preclude. As the Commission is aware, the rulemaking process at the agency is likely to take the better part of a year and petitions for reconsideration and appeals can postpone the effectiveness of any new rules for years.

During that time, interfering radar detectors would continue to proliferate, expanding embedded consumer use and making enforcement more difficult and less effective. Thus, reliance solely on the-rulemaking process to resolve radar detector interference will increase

the level of disruption to the reliable functioning of VSAT networks and the critical infrastructure sectors all VSATs serve. There is, however, another option the Commission may exercise that would be a highly effective response to the specific issue of halting the proliferation of harmful interference to licensed VSATs: remove this issue from the rulemaking for handling in the context of an enforcement action.

Enforcement proceedings are intended to focus the Commission's resources on expedited action to redress the public interest harms posed by ongoing and systemic violations of the Commission's Rules. Rulemaking is intended to prospectively address issues of broad applicability. In this instance, sole reliance on the rulemaking process for remedial action directed at the undisputed fact that radar detectors generate very high emission levels would produce the absurd result of requiring licensed VSATs to accept harmful interference from unlicensed detectors for years to come. This result is plainly at odds with the public interest because it could establish as precedent a limitation on the Commission's ability to preserve the integrity of its spectrum management responsibilities through prompt elimination of known sources of harmful interference to licensed spectrum users. If an unlicensed receiver produces such high levels of emissions that it is possible to readily confirm the linkage between receiver use and harmful interference to licensees, the receiver manufacturer would acquire a reasonable expectation of being able to continue sale of the receivers in interstate commerce for a period of months (or more likely, years) until a rulemaking proceeding that addresses the interference issue is concluded. Licensed users in the band (as well as the licensee's customers) could then be required to accept increasing

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[23] *See* 47 C.F.R. § 15.5(b).

levels of harmful interference from the unlicensed devices until the rulemaking concludes. Even if there is a very high likelihood that the Commission will ultimately adopt rules intended to resolve the harmful interference, the relief comes too late because the damage has already been done. Consumer confidence in the VSAT industry has been destroyed. During the pendency of the rulemaking, inventories of the unlicensed receivers continue to be produced and sold to consumers for years to come, needlessly undermining the Commission's ability to develop a meaningful way of effectively abating the interference or adequately redressing the harm to those reliant on the licensed services.

Expedited development of a workable enforcement strategy to cease and abate interfering radar detector operations is challenging, but not impossible. The inherent flexibility of enforcement action contemplates bringing together detector manufacturers and licensed VSAT providers to develop a schedule for timely and effective interference abatement. Elements of such an abatement schedule should include milestones for detector manufacturers to cease production, importation and sale of detectors that generate harmful interference to licensed VSATs. It is also necessary to remove all inventories of such detectors from interstate commerce. Interference generated by the embedded consumer use of the detectors can be substantially reduced through creating positive incentives for returning interfering models to the manufacturer, such as, for example, "buy back" or "trade in" programs.

An enforcement proceeding could easily be completed in less than six months, establishing a timely and effective mechanism for interference abatement. The Commission has broad authority to ensure that the public's spectrum resource is managed in the public interest, and that those spectrum uses important enough to merit licensee status are protected

from unlicensed receivers causing harmful interference.[24] Therefore, Spacenet/StarBand urge the Commission to promptly refer to the Enforcement Bureau the task of eliminating this confirmed source of harmful interference to licensed VSAT operations.

III. MODIFICATION OF THE COMMISSION'S PART 15 RULES TO INCLUDE EMITTERS ABOVE 960 MHZ IS CENTRAL TO RELIABLE OPERATIONS OF SERVICES LICENSED IN THESE BANDS

Spacenet/StarBand also seeks assurance that licensed operations in the Ku and Ka Bands will not be placed at risk by introduction of new unlicensed devices into the band. That can only be accomplished by modifying Part 15 of the Commission's Rules to broaden the applicability of emission limits and streamlined equipment authorization. Adoption of such rule modifications are well supported by the recent trend towards increasingly intensive licensed use of the spectrum from 960 MHz to 38.6 GHz, and the parallel proliferation of affordable unlicensed devices operating above 960 MHz.[25]

Specifically, Spacenet/StarBand urge the Commission to modify Section 15.101(b) of its Rules by extending the upper limit of receivers subject to equipment authorization from 960 MHz to 38.6 GHz. We recognize adoption of the 38.6 GHz upper limit will require a larger universe of unlicensed devices to obtain equipment authorization. Nonetheless, we submit that extending applicability of the Commission's equipment authorization rules is the most effective and least burdensome means of minimizing the potential for harmful interference to licensees and the members of the public relying on their services. With the Commission's recent streamlining of the entire equipment authorization process, the regulatory burden associated with broadening applicability to receivers is minimal.

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[24] 47 U.S.C. §§ 151, 154(□), 301, 302, 333 and 510.

[25] The Commission has taken official notice of these facts. *NPRM*, ¶ 2.

Moreover, amending Part 15 of the Rules in this way will establish a simple and direct mechanism for routine enforcement against manufacturers of violating devices.

Spacenet/StarBand further contend that there may be a need to modify Section 15.209 of the Commission's Rules to effectively minimize harmful interference to FSS downlinks operating in Ku and Ka bands. During the course of studying the emission levels generated by radar detectors in those bands, Spacenet/StarBand developed radiated emission limits that are tailored to protect downlink operations from the type of interference specific to the interfering detectors. While Spacenet/StarBand does not have sufficient data to analyze whether these radiation emission limits should be applied to all bands above 960 MHz, there is ample empirical support for our analysis of the potential for harmful interference to FSS downlinks in the Ku/Ka bands from proximate spectrum use. Thus, we provide a summary of our specific proposal for the Ku and Ka Bands, and we explain the basis for this proposal by attaching our technical analysis.[26] A primary consideration underlying the technical analysis is the Commission's acknowledged acceptance of the fact that satellite downlinks use very low receive levels. Consistent with the Commission's discussion of the restricted frequency bands above 38.6 GHz, specific bands or band segments above 960 MHz that support "sensitive" licensed radio services may also require higher emission limits than general application of Section 15.209 contemplates.[27]

Specifically, Spacenet/StarBand proposes that the Commission limit the permissible radiated emissions in the FSS and BSS Ku and the GSO FSS Ka band downlinks to -154

[26] The technical analysis used to derive our proposed radiated emission limits is found in Attachment 2.

[27] *NPRM,* ¶¶ 7-10.

dBm/100 kHz[28], measured in accordance with the testing procedures specified in Sections 15.109,[29] 15.31, and 15.33 of the Commission's Rules.[30]

IV CONCLUSION

Spacenet/StarBand ask that the Commission eliminate harmful interference to its licensed VSAT stations in the Ku and Ka bands through combined exercise of the Commission's enforcement and rulemaking authority. The Commission should refer to the Enforcement Bureau for expedited resolution the undisputed existence of harmful interference to licensed VSAT stations from unlicensed radar detectors generating very high levels of unintentional emissions in the Ku and Ka bands. To minimize the potential for future interference, Spacenet/StarBand recommend modification of Part 15 to extend the equipment authorization requirement to receivers tuning to a maximum upper frequency of 38.6 GHz. In addition, Spacenet/StarBand request that the Commission consider adoption of emission limits tailored to protect sensitive downlink operations in the Ka and Ku Bands. Spacenet/StarBand encourage the Commission to act immediately to implement these

[28] *See* 47 C.F.R. § 25.202.

[29] The radiated emissions standards are given in Section 15.109 of the Rules. That Section currently specifies a limit of 500 □V/m measured at 3 meters from the emission source for all devices operating above 960 MHz other than Class A digital devices. Spacenet/StarBand has specified the proposed limit in dBm, a common measurement unit at Ku and Ka band frequencies. While we believe that expressing the limit in common units makes sense, we have no objection to stating the limit in an equivalent form such as □V/m. attachment #2 provides the technical basis for the recommended –154 dBm/100 kHz limit.

[30] In addition to emission limits specific to the Ka and Ku bands, it is necessary to establish a 100 MHz guard band on every band edge, including the adjacent 9.3-10.3 GHz band, to avoid degradation of VSAT receive electronics performance through compression from high levels of out-of-band emissions.

recommendations, as the need for a coordinated action to curtail this known source of harmful interference to licensed VSAT operations is timely and critical.

Respectfully submitted,

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ATTACMENT #1

(Redacted FCC Staff Report, FCC LaboratoryTesting of Radar Detectors)

All units which I tested use a form of swept emission, some, or all of which, fall within the frequency band of concern (11.7 - 12.2 GHz). Emission levels were not constant across the swept frequency band. Hence, where feasible, the highest emission outside, and the highest emission within, the band of concern is listed. Emission frequencies and the levels from each of the devices tested are listed below.

Summary of FCC Lab data

Sample No.	Make/ Model	Emission Frequency (GHz)	Emission Level (uV/M)	Emission Frequency Band (GHz)	Exceeds 15.109(a) by:
1.	Escort	11.42	30,549	11.40 - 11.78	35.7 dB
"	Passport 7500	11.77	33,113		36.4 dB
2.	Bel-Tronics Co.	11.59	33,497	10.87 - 11.99	36.5 dB
"	Express	11.73	36,728		37.3 dB
3.	Phantom II	11.47	346,737	11.46 - 11.82	56.8 dB
"		11.71	231,739		53.3 dB
4.	Cobra	11.77	88,105	11.77 - 12.17	44.9 dB
"	ESD-9100	12.07	63,826		42.1 dB

(Bel-Tronics Model 950 is reported by complainant to have significantly lower emissions, but has not been tested by FCC.)

This is a follow-up to my report dated February 5, 2001, which detailed the measurement results of receiver Local Oscillator (L.O.) emission levels of four (4) sample automobile speed RADAR detectors. Three (3) additional samples were submitted by the original complainant, Spacenet, Inc., for our evaluation. As in the original report, the emission frequencies and levels from each of the three additional devices tested are listed below:

Sample No.	Make/ Model	Emission Frequency (GHz)	Level (uV/M)	Emission Frequency Band (GHz)	15.109(a) by:	Exceeds
5.	Uniden	11.32	188,365	11.07 - 12.13		51.5 dB
"	LRD 737	11.73	127,350		48.1 dB	
6.	Bel-Tronics	14.39	147,911	14.35 - 15.52		49.4 dB
"	Bel 950	15.00	177,828			51.0 dB
7.	Whistler	11.49	162,181	11.44 - 11.81		50.2 dB
"	1650	11.77	158,489			50.0 dB

It should be noted that of all seven units which we tested, only sample #6 has L.O. emissions which do not fall within the 11.7 - 12.2 GHz VSAT frequency band. This model would therefore would not appear to serve as an interference source to VSAT terminals. Its effects, if any, on occupants of 14.35 - 15.52 GHz spectrum is unknown.

ATTACHMENT #2
(Spacenet/StarBand Technical Analysis of Radiation Emission Limits)

The effect of radar detector generated interference into VSATs range from momentary interruptions of the downlink bit stream, resulting in bit errors, to a total loss of synchronization or signal lock, resulting in complete interruption of message transactions. The severity of the impairment depends on the proximity of the radar detector to the VSAT antenna, the emission level of the radar detector in relation to the downlink signal from the satellite, and the emission frequency relative to the VSAT signal in question. The proposed limit for the emissions of unlicensed devices in the geostationary satellite bands was calculated according to the following analysis. This analysis uses a reference link budget for a typical Ku-band 64 kbps hub-to-VSAT ("outbound") carrier transmissions received by a 1.2 meter VSAT antenna, the smallest routinely licensed Ku-Band antenna under Part 25 of the FCC regulations. The reference link budget is provided at the end of this exhibit. The below block diagram depicts a typical VSAT experiencing radar detector interference.

Analysis

The carrier power of the desired outbound satellite signal at the VSAT antenna input is calculated using the formula below[31]:

Carrier Power at Antenna Input (dBW) = Satellite Saturated EIRP (dBW) - COPBO (dB) - Path Loss (dB)

Using values from the sample link budget the carrier power at the antenna input can be calculated as follows[32]:

Carrier Power at Antenna Input (dBW) = 50.0 dBW - 31.0 dB - 205.6 dB
= -186.6 dBW or -156.6 dBm

Thus, typical outbound signal levels received at the input to the VSAT antenna are -156 dBm for a 64 kbps VSAT downlink signal that occupies a 100 kHz of bandwidth. The following

[31] COPBO stands for "Carrier Output Back-Off", which is the decibel value the carrier operates below transponder saturation EIRP. Path loss is the signal loss due to separation of the satellite and VSAT at the downlink frequency of operation.

[32] To convert the units from dBW to dBm 30 dB is added (10 Log { 1,000 mW / 1W } = 30 dB).

calculations assume that a single emitting unlicensed device may be as close as 3 meters[33] to the VSAT antenna and that the link degradation due to the interference will not exceed 0.1 dB. Allowable link degradation of 0.1 dB is consistent with assumptions utilized in the extensive study performed by the European Telecommunications Standards Institute (ETSI) on this subject[34].

The link budget indicates a total carrier-to-noise power spectral density ("C/No") for the link is 58.8 dB-Hz. This C/No corresponds to a carrier-to-noise ratio ("C/N") of 10.7 dB (using the symbol rate of 64 ksps to convert noise power spectral density "No" to noise power "N"). For a link degradation of 0.1 dB the interference noise power must be 17 dB below the link noise.[35] Therefore, the maximum interference emission level must be 27.7 dB below the carrier level at the earth station receiver for a total C/N degradation of 0.1 dB to 10.6 dB.

Earth station antennas are authorized for installation at elevation angles as low as five degrees. The antenna off-axis gain at five degrees must be at most 11.5 dBi.[36]

A 1.2-meter Ku-Band antenna has a nominal receive gain of 41.7 dBi (see link budget "RECEIVE E/S: Antenna Gain"). Therefore, the earth station antenna will provide an off-axis isolation of 30.2 dB (41.7 dBi minus 11.5 dBi) between the desired outbound signal and terrestrial interference signal. The maximum allowable interference power level at the input of the antenna can now be calculated as follows:

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[33] Three meters is also the reference distance for Part 15 field strength limits. *See* 47 C.F.R § 15.109(a). Although multiple devices can be present this analysis will assume interference from a single radar detector.

[34] ETSI Technical Report ETR 077, Satellite Earth Stations (SES); Spurious radiation limitations to and from satellite earth stations, Very Small Aperture Terminals (VSAT) and Television Receive Only.

[35] C/N (with radar detector interference) = -10 Log { $10^{(-10.7/10)} + 10^{(-27.7/10)}$ } = 10.6 dB

[36] *See* 47 C.F.R. § 25.205, which allows for earth station antennas to be installed as low as five degrees of elevation angle and 47 C.F.R. § 25.209, which allows for off-axis antenna gain as high as 29 – 25 Log (□°) dBi for □ off axis angles between 1 and 7 degrees. Therefore, the Earth Station Antenna Gain at five degrees off-axis is 29 – 25 Log (5°) = 11.5 dBi.

Interference at Antenna Input (dBm) = Carrier Power at Antenna Input (dBm) – C/N Isolation Required (dB) + Antenna Gain Isolation (dB)

Interference at Antenna Input (dBm) = -156.6 dBm - 27.7 dB + 30.2 dB = –154.1 dBm

Conclusion

Since the reference carrier occupies a 100 kHz bandwidth[37], the maximum interference power allowed for 0.1 dB of link degradation is referenced to the occupied 100 kHz bandwidth. Therefore, the maximum allowable interference emission referenced at the input of the VSAT antenna assumes 100 kHz of bandwidth or -154 dBm/100 kHz.

[37] See reference link budget "Transponder Bandwidth Allocation" at the bottom of the link budget.

REFERENCE OUTBOUND LINK BUDGET

(DOES NOT INCLUDE INTERFERENCE FOR PART 15 EMISSIONS)

FROM: HUB - MCLEAN, VA

TO: VSAT - CHICAGO, IL

REQUIREMENTS

Availability	(%):	99.905
Required Eb/No	(dB):	6.50
Bit Error Rate	:	10E-7
Modulation Type	:	QPSK
Info. Rate	(Kbps):	64.00
FEC Rate	:	0.50
Spread Spectrum Factor	:	1.56
Modem Step Size	(kHz):	10.00

SATELLITE

Satellite		GE-4
Satellite West Long	:	101.0
Transponder		KU
Usable Trnspndr BW	(MHz):	36.00
SFD @ 0 dB/K	(dBW/M^2):	-92.00
Transponder Atten	(dB):	10.0

TRANSMIT E/S

North Lat: 38.9	West Long:	77.2
Frequency	(GHz):	14.25
Satellite G/T	(dB/K):	5.20
Antenna Diameter	(m):	5.6
Antenna Gain	(dBi):	57.10
Antenna Elevation	(Deg):	38.65
Carrier EIRP	(dBW):	48.99
Power Control	(dB):	6.00
Output Circuit Loss	(dB):	4.00
Path Loss	(dB):	207.12
Other Losses	(dB):	0.70
(other loss = atm,pol,ant point)		

RECEIVE E/S

North Lat: 41.8	West Long:	87.7
Frequency	(GHz):	11.95
Satellite EIRP	(dBW):	50.00
Antenna Diameter	(m):	1.2
Antenna Gain	(dBi):	41.70
Antenna Elevation	(Deg):	39.80
LNA Noise Temp	(K):	58.30
Loss betw.LNA & Ant.	(dB):	0.20
System Noise Temp.	(K):	100.71
Station G/T	(dB/K):	21.67
Path Loss	(dB):	205.57
Other Losses	(dB):	0.60

INTERFERENCE

C/Io Adj Sat U	(dB-Hz):	71.20	C/Io Intermod	(dB-Hz):	67.07
C/Io Adj Sat D	(dB-Hz):	64.20	C/No Thermal Up	(dB-Hz):	68.97
C/Io Crosspol	(dB-Hz):	76.46	C/No Thermal Dn	(dB-Hz):	63.10
C/Io Adj Channel	(dB-Hz):	78.70	C/Io Total	(dB-Hz):	61.54
C/Io Adj Trans	(dB-Hz):	78.86	C/No Therm Total	(dB-Hz):	62.10
C/Io Microwave	(dB-Hz):	N/A	C/No Total	(dB-Hz):	58.80

RAIN ATTENUATION

Overall Link Margin	(dB):	4.24	Rain Model	: CRANE
Uplink Availability	(%):	99.978		
Rain Margin	(dB):	10.24	Uplink Rain Zone	: D2
Dnlink Availability	(%):	99.927		
Rain Margin	(dB):	3.32	Downlink Rain Zone	: D2
G/T Degradation	(dB):	4.05		

TRANSPONDER

Number of Carriers	:	MULTIPLE
Total OPBO	(dB):	4.00
Total IPBO	(dB):	6.10
Carrier OPBO	(dB):	31.00
Carrier IPBO	(dB):	33.10

H.P.A

Number of Carriers	:	1.0
Total HPA OPBO	:	8.00
HPA Power/Carrier	(dBm):	25.89
Required HPA Size	(dBW):	3.89
Required HPA Size	(W):	2.45

FCC Req: 1) Uplink Flange Density	(dBW/4kHz):	-22.09
(@51.0) 2) Downlink EIRP Density	(dBW/4kHz):	6.00
Transponder BW Used Per Carrier (x1.00)	(%):	0.28
Transponder Power Used Per Carrier	(%):	0.20
Transponder Bandwidth Allocation	(MHz):	0.100